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Canadian Patents Database

(12) **Patent:** (11) **CA 657669**

(54) COIL LIFTING AND POSITIONING MECHANISM

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ABSTRACT:

CLAIMS: Show all claims

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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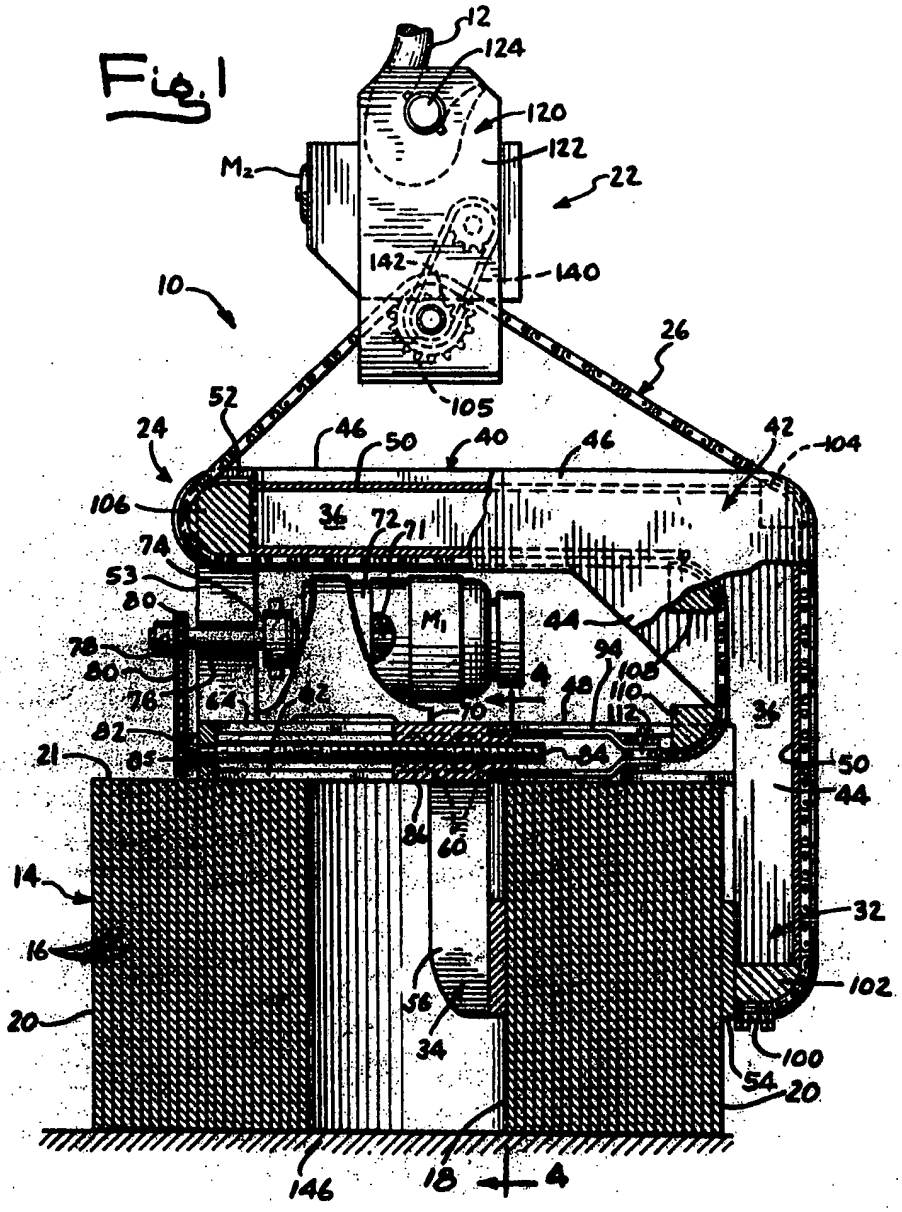
Important Notices

Fig. 1



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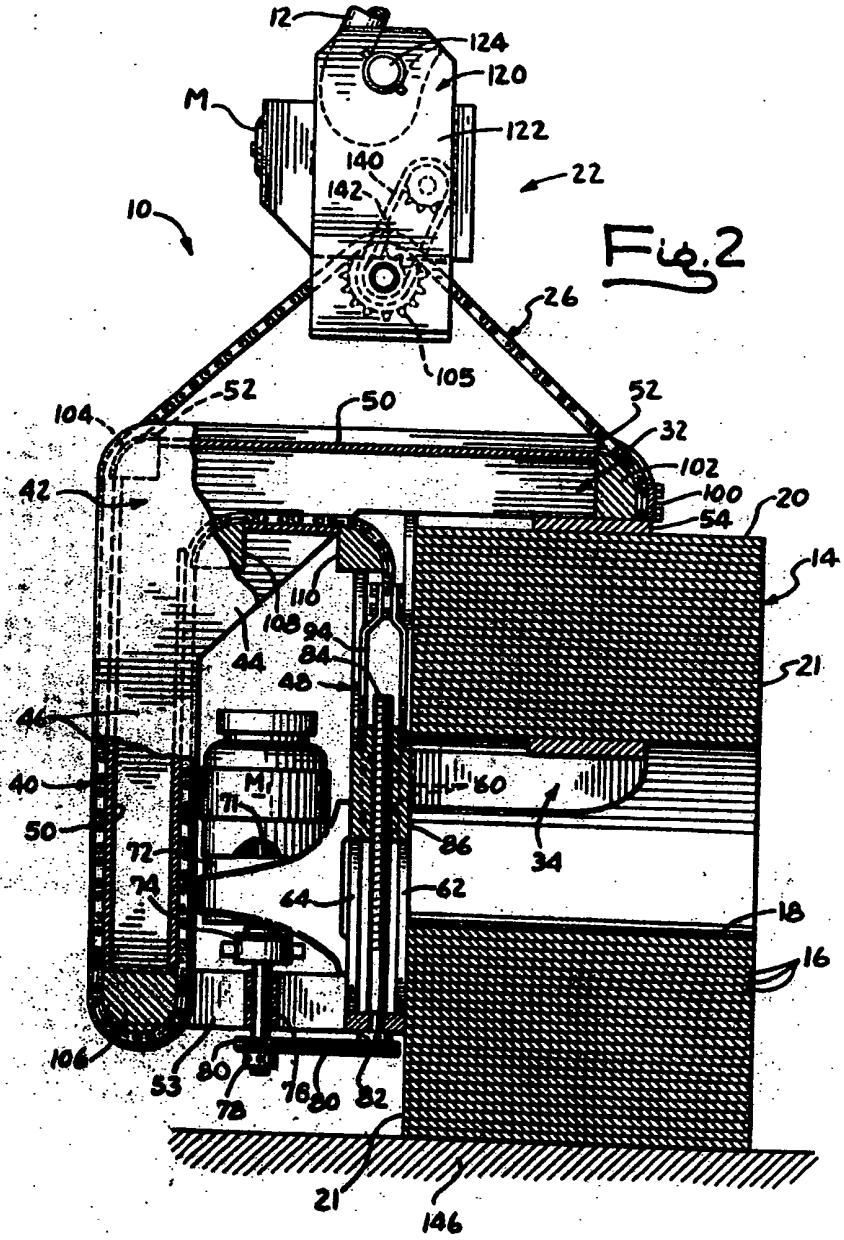

Fig. 2

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Fig. 3

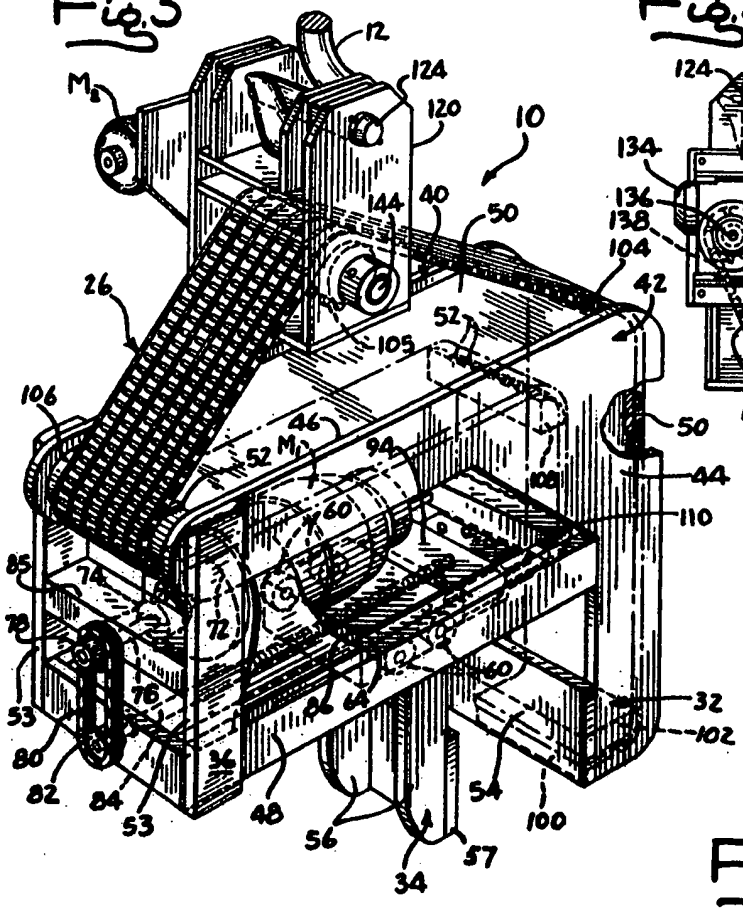


Fig. 5

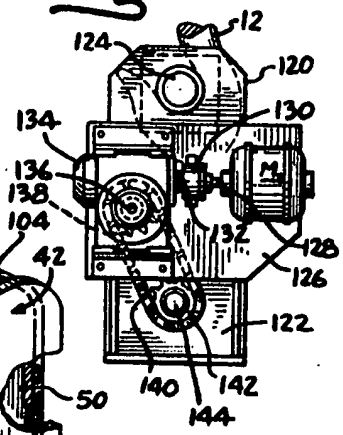
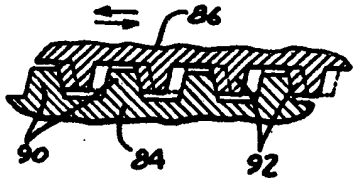


Fig. 6



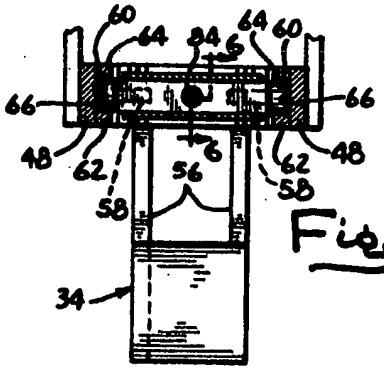


Fig. 4

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The present invention relates to mechanism for lifting and transporting sheet metal stock in coil form, the coils being wound in convolute fashion to produce a series of laminations which are continuous throughout the coils and which produce, in the final shape of the coils, generally tubular integral laminated spool-like structures, the innermost convolutions of which define central bores which extend axially through the spools.

The handling of sheet metal coils of the character set forth above, either at the steel mill for loading purposes, or at a consumer location which a coil is distributed throughout the plant for unwinding at a punch press, for example, presents a problem due to the fact that the cylindrical shape of the coil makes it awkard and thus difficult to handle. It is sometimes necessary to pick up such a coil when the same is supported with its longitudinal axis extending vertically, transport it to a different location and place it on a supporting surface with its axis extending horizontally. At other times, conversely, it is necessary to engage the coil when the same is in a horizontal position. Present day lifter mechanisms have been provided with accessory devices which will enable them to handle coils of this general character for transportation from one place to another, but invariably, it is necessary that the coils be initially received or engaged by the lifter mechanism when they are supported either in a horizontal position or in a vertical position, and no provision is made for releasing the coils in any other position than the one in which they are received. Present day coil lifting devices are generally of the character shown and described in United States Patent to Hooker et al, No. 2,841,434, granted on July 1, 1958 and entitled "AUXILIARY COIL LIFTING DEVICE FOR THE JAWS OF A SHEET LIFTER."

*

The present invention is designed to overcome the above-noted limitation that is attendant upon the construction and use of conventional coil lifting mechanism of the type shown in the above-mentioned patent to Hooker et al, and toward this end, it contemplates the provision of a novel lifter construction whereby the lifter may initially receive the coil in practically any portion of orientation, whether the coil be disposed with its axis extending horizontally, with its axis extending vertically, or whether the coil be positioned at some intermediate angle, and which lifter, further, is capable of depositing the coil in any desired position, whether horizontal, vertical or otherwise.

The provision of a coil lifter of the general character set forth above being among the principal object of the invention, it is a further object to provide a mechanism which is so designed that it may receive the coil in one given position and deposit it in a different position with the transition between the two coil positions taking place by an angular movement of the coil about an axis which is coincident with or not appreciably removed from the center of mass of the coil so that a minimum amount of torque need be applied to the coil and to the coil-supporting structure which moves therewith as the coil is being turned.

Another object of the invention, in a positioning lifter of this character, is to provide a novel form of coil-engaging clamping jaw mechanism including a pair of cooperating clamping jaws adapted to engage a portion of a coil to be lifted therebetween, together with means whereby the clamping jaws may be initially brought to preliminary clamping engagement with the coil, and thereafter, when lifting force is applied to the lifter mechanism bodily as a whole, an additional degree of clamping force is

automatically applied to the clamping jaws, the amount of force so applied being proportional to the weight of the coil undergoing lifting so that the heavier the coil, the greater will be the degree of clamping force applied to the latter.

Numerous other objects and advantages of the invention not at this time enumerated will become more readily apparent as the following description ensues.

In the accompanying three sheets of drawings forming a part of this specification, one illustrative embodiment of the invention has been shown.

In these drawings:

Fig. 1 is a sectional view taken substantially centrally and vertically through a coil lifting and positioning mechanism constructed in accordance with the principles of the present invention and showing the same operatively applied to a coil which is disposed in a vertical position, the lifter being shown in the condition which it assumes immediately prior to the coil elevation operation;

Fig. 2 is a sectional view similar to Fig. 1 with the coil lifter being shown in the condition which it assumes after the coil has been turned through an angle of 90° and immediately prior to release of the coil;

Fig. 3 is a front perspective view of the coil lifter with certain parts being broken away to more clearly reveal the nature of the invention;

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary side elevational view of a traction hoist mechanism employed in connection with the present invention; and

Fig. 6 is an enlarged sectional view taken substantially along the line 6—6 of Fig. 4.

Referring now to the drawings in detail and in particular to Figs. 1 to 3, inclusive, a lifter constructed in accordance with the principles of the present invention has been designated in its entirety at 10. The lifter disclosed herein constitutes a preferred form of the invention and it is adapted to be attached to and used in connection with the crane of an overhead hoist, the lifting hook of such a hoist being designated at 12. The lifter constitutes a medium or instrumentality for handling laminated sheet metal coils such as the coil 14 in moving the coils from one location to another end, in so moving them, if desired, altering their position in space with respect to a horizontal plane.

The coil 14 is of conventional design and consists of a single unitary elongated strip of sheet metal which has been wound in convolute fashion on a mandrel to produce a series of adjacent convolutions 16 of the sheet material, and the mandrel subsequently withdrawn so that the spool-like article having a central bore 18 extending therethrough and presenting a substantially cylindrical outer surface 20 and substantially flat end faces 21 are produced. The lifter 10 has been designed primarily for transporting such coils from one location to another with the lifter receiving a coil in a vertical position, i.e., in a position wherein one of the annular end faces 21 rests squarely on a supporting surface, and for depositing the coil either in the same position or in a horizontal position wherein the cylindrical surface 20 thereof is placed tangentially on a supporting surface at the time the coil is released. Alternatively, the lifter 10 has been designed so that it may receive the coil in a horizontal position, transport it, and thereafter, release the same in a vertical position. It is within the scope of the present invention,

however, that the lifter 10 may be employed for receiving a coil in any intermediate position as between the vertical position wherein it is illustrated in Fig. 1 and the horizontal position wherein it is illustrated in Fig. 2 and for discharging the coil in the same or in any other intermediate position. Irrespective, however, of the particular use to which the present lifter construction may be put, the essential features of the invention are at all times preserved.

The lifter selected for illustration herein is comprised of three principal parts or assemblies including a self-contained motor-driven assembly designated in its entirety at 22 and hereinafter referred to as the traction hoist assembly; a tiltable assembly designated in its entirety at 24 and hereinafter referred to as the tiltable lifter proper; and an interconnecting flexible medium which may be in the form of a conventional compound roller chain assembly 26 by means of which the tiltable lifter proper 24 is suspended from the traction hoist assembly 22 for swinging movements about a horizontal axis in a manner that will be made clear presently.

The tiltable lifter proper 24 includes a pair of co-operating lifter jaws 32 and 34, respectively, the jaw 32 being fixed relative to the frame structure 36 and the jaw 34 being movable toward and away from the jaw 32 for coil-clamping and coil-releasing purposes, respectively. As best seen in Figs. 1 and 2, the jaw 32, which will hereinafter be referred to as the fixed jaw, is adapted to engage the outside cylindrical surface 20 of the coil 14, while the jaw 34, which will hereinafter be referred to as the movable jaw, is adapted to engage the inside cylindrical surface of the bore 18 so that one side of the tubular coil 14 may be compressed and thus clamped between the two jaws 32 and 34 for coil-lifting and

coil-orientating purposes as will also be subsequently described.

The lifter assembly proper 24 involves in its general organization the previously mentioned casing or framework 36 which, as shown in Fig. 3, includes a pair of spaced parallel side members 40 and 42 of generally F-shaped design and each of which includes a vertical leg 44 and upper and lower horizontal legs 46 and 48, respectively. The two side members 40 and 42 are maintained in their parallel spaced relation by means of intervening plates 50 which are welded along their side edges to the inside opposed faces of the side members in such a manner as to provide a substantially continuous, chain-winding drum surface, as will be described in detail presently. Chain guide rails 52 extend along the drum surface for chain centering purposes. Vertical struts or plates 53 extend between the distal ends of the legs 46 and 48 for reinforcing purposes.

A vertical plate 54 is welded to the edges of the vertical legs 44 of the side members 40 and 42 and constitutes the fixed jaw proper. The movable jaw 34 includes a pair of spaced parallel side plates 56 (Fig. 4) and a cross plate 57. The upper ends of the plates 56 carry transversely extending shafts 58 on which there are mounted rollers 60 adapted to ride on a pair of lower tracks on rails 62 welded to the inside faces of the members 48. Upper rails 54 serve to confine the rollers 60 in channel-like guides 66. The guides 66 extend in a direction normal to the operative vertical face of the jaw plate 54 so that the movable jaw is constrained to travel in a horizontal linear path as viewed in Figs. 1 and 3 toward and away from the fixed jaw 32.

The movable jaw 34 is adapted to be power-driven, which is to say that its movements toward and away from the jaw 32 are effected under the control of a reversible electric motor M1.

The motor M1 is operatively mounted on a base 70 which extends across the upper edges of the two horizontal legs 48. The output shaft 71 of the motor M1 is operatively connected through a gear reduction device 72 to a torque limiting clutch 74 and the output shaft 76 of the clutch 74 carries a sprocket wheel 78. The sprocket wheel 78 is connected by means of a chain 80 to a second sprocket wheel 82 mounted on a feed screw or shaft 84 which extends longitudinally of the horizontal legs 48 and which is rotatably journalled in a bearing assembly 85 supported between the two horizontal legs 48. The feed screw 84 is threadedly received through a block or nut 86 which is interposed between and welded to the two vertical side plates 56 of the movable jaw assembly 34, provision being made for a certain amount of looseness or lost motion between the screw threads formed on the feed screw and the internal screw threads provided in the block 86 as shown in Fig. 7 and in a manner and for a purpose that will be made clear presently. It will be seen, therefore, that upon rotation of the motor shaft 71 in one direction or the other, the feed screw will be correspondingly rotated through a power train including the chain and sprocket mechanism 76, 78, 80, and the movable jaw 34 will be moved toward or away, as the case may be, from the fixed jaw 32. During such motion of the movable jaw 34, the rollers 60 will travel tractionally on the tracks or rails 62.

As will become more clear presently when the description of the operation of the present lifter construction is set forth, the motor M1 is employed for initially advancing the movable jaw 34 toward the fixed jaw to grip the cylindrical wall of the coil assembly 14 therebetween, as previously described. Means are further provided whereby after such initial gripping or clamping

action of the jaw sections 32 and 34, upon lifting of the coil 14 from the surface on which it is supported, a further clamping action of the jaw sections will be effected under the influence of the combined weight of the lifter proper 24 and of the coil supported thereby.

Accordingly, as shown in Fig. 7, the adjacent threads 90 provided on the feed screw 84 are separated from each other by a distance greater than the width of the threads 92 provided on the nut or block 86 so that the entire assembly including the block 86 and the movable jaw 34 to which it is affixed is possessed of a limited degree of axial movement relative to the feed screw. As will become clear presently, the block 86 has pivotally connected thereto the forked end of a link 94 and the other end of the link is connected to the chain assembly 26 in such a manner that the chain assembly will become effective when the lifter proper 24 is freely suspended by means of the chain assembly to exert a pulling force on the movable jaw assembly 34 in a direction tending to move the latter toward the fixed jaw 32.

The supporting chain assembly 26 is of conventional design and consists of an assembled series of alternate roller links and pin links and in which the pins are free to pivot within the bushings of the roller links with minimum clearance, thus permitting free articulation and lubrication. As best seen in Fig. 3, the roller chain 26 is of multiple link width. One end of the chain is firmly clamped as at 100 to the casing or framework 36 near the lower end of the fixed jaw 32 and from thence the chain passes around a curved rail supporting member 102 upwardly along the vertical leg 44, and around a second curved rail-backing member 104. From the curved member 104, the chain assembly 26 passes over a drive sprocket or wheel 105 associated with the traction hoist

assembly 22 and from this latter sprocket, the chain extends forwardly and around a third curved member 106, and from thence inwardly in reentrant fashion beneath the plate structure and around an arcuate face provided on a guide block 108 extending between the side members of the leg 46, downwardly along the inside edge of the vertical leg 44, around a guide block 110 similar to the block 108, and finally, horizontally a short distance with the other end of the chain being attached as at 112 to an end of the forked link 94. The length of the chain is such that in its free state, a certain amount of slack will exist in the chain throughout the tortuous path which it follows and which has been described above. The chain 26 constitutes the sole suspension means whereby the lifter assembly proper 24 is supported from the traction hoist assembly 22, and when the traction hoist during any given lifting operation, is initially raised for coil-transporting purposes, the slack in the chain is taken up in the manner indicated in Figs. 1 and 2 so that the chain becomes taut around the various curved surfaces 102, 104, 106 and the blocks 108 and 110, thus exerting a considerable degree of pulling force on the forked link 94, and consequently, upon the movable jaw assembly 34 so that a powerful clamping action will obtain between the two jaws 32 and 34.

Referring now to Figs. 1 and 6, the traction hoist assembly 22 involves in its general organization a casing structure 120 of open-ended, inverted, box-like design and including a pair of vertical extensions 122, across which there extends a lift pin 124 designed for cooperation with the lifting hook 12 of the crane structure. The casing or framework 120 includes a pair of supporting brackets 126 for an electric motor M2 having a motor shaft 128 operatively connected, through a slip clutch

mechanism 130, to the input shaft 132 of a conventional worm and gear reduction mechanism 134 having an output shaft 136. The output shaft 136 carries a sprocket 138 which is connected by means of a chain 140 to a sprocket 142 carried on a drive shaft 144 rotatably journalled in the casing structure 120. The drive shaft has mounted thereon the previously mentioned drive sprocket 105 over which the chain 26 passes.

OPERATION OF THE APPARATUS

In the operation of the coil lifting and positioning mechanism 10, assuming that a coil 14, resting upon a supporting surface 146 as shown in Fig. 1 with the longitudinal axis thereof extending vertically, is to be picked up or lifted and transported to another location and deposited on the supporting surface as indicated in Fig. 2 with its axis extending horizontally, the crane is operated to bring the mechanism 10 into vertical register with the coil 14 while the jaws 32 and 34 are substantially vertically aligned with a region of the cylindrical wall of the coil. The lifting hook 12 is lowered so that the jaws 32 and 34 may straddle the coil wall as illustrated in Fig. 1. Vertical register of the jaws 32 and 34 with the coil wall for operative clamping purposes is made possible by initially operating the motor M2 in one direction or the other, as the case may be, to cause the traction drive sprocket 105 to move or slide the chain, so to speak, over the upper portions of the sprocket until such time as the lifter assembly proper 24 assumes the position wherein it is illustrated in Fig. 1 with the leg 44 extending vertically and with the legs 46 and 48 extending horizontally. The motor M1 is operated in such a manner as to rotate the feed screw 84 in a direction which will move the movable jaw 34 away from the fixed jaw 32 and the motor M1 is maintained energized until such time

as a sufficient clearance is attained between the two jaws to accommodate the thickness of the coil wall. Upon lowering of the assembly 24 over the coil 14, the upper end of the coil wall will abut against the lower horizontal edge of the leg 48, thus limiting the downward extent of movement of the assembly 24. Thereafter, the motor M1 is operated in a direction to cause the movable jaw 34 to move towards the fixed jaw 32 until such time as the wall of the coil 14 is firmly clamped between the two jaws. At this time, the torque limiting clutch 74 will commence to slip, but because of the relatively great extent of gear reduction offered by the worm reducer 72, a self-locking action will take place wherein the wall of the coil 14 is firmly clamped between the two jaws. The torque limiting clutch may be of any desired conventional construction.

Immediately after the two jaws 32 and 34 have been brought into clamping relationship with respect to the coil 14 under the control of the motor M1, the crane is operated to elevate the traction hoist mechanism 22 whereupon any slack which may exist in the chain 26 will be taken up and a powerful tension will be applied to the chain. The magnitude of such tension will be a trigonometric function of the angles involved in the triangle existing between the points of tangency of the chain 26 with the curved surfaces 104 and 106 and the point of tangency of the chain in passing over the drive sprocket 105.

After the coil wall has thus been firmly clamped between the two jaws 32 and 34 and the coil elevated from the supporting surface

146, the motor M2 is operated in such a manner as to cause the traction drive pulley 105 to rotate in a counterclockwise direction, as viewed in Figs. 1 and 3, whereupon the driving sprocket will tend to run beneath the chain 26, so to speak, to the right as viewed in these figures. Inasmuch as the traction hoist 22 is supported on the hook 12 and thus exerts a reaction force on the chain 26, the latter will be slid to the left, as viewed in Fig. 1, and in so sliding, the chain 26 will unwind, so to speak, from the vertical leg 44 and move against the horizontal leg 46 as the entire lifter assembly proper 24 turns bodily about an axis which, roughly, represents the center of gravity of the assembly.

At such time as the assembly 24 assumes a position wherein the vertical leg 44 of Fig. 1 assumes a horizontal position, the hook 12 will be lowered to a sufficient degree to relieve the tension of the chain 26 and the motor M1 may be operated in a direction to rotate the feed screw 84 and cause the movable jaw 34 to be moved away from the fixed jaw 32 and thus release the coil wall. The crane may then be operated to shift the entire assembly to the left, as viewed in Fig. 2, whereupon the jaws will move out of register with the coil wall and the coil will remain supported on the surface 146 in its horizontal position.

It is to be noted at this point that while the assembly 24 is operatively suspended from the chain 26, the clamping action of the motor M1, operating through the slip clutch or torque limiting device 74, is augmented by the degree of tension which is applied to the chain and which operates through the forked link 94 directly upon the nut or block 86 which constitutes an element of the movable jaw assembly 34.

When it is desired to pick up and transport a coil 14 which

initially assumes a horizontal position on the supporting surface 146 and to deposit it in a vertical position at another location on such surface, a reversal of the operations described above may be resorted to. It is obvious that the lifter mechanism 10 of the present invention may be employed for receiving coils which are disposed at any intermediate position as between the vertical position illustrated in Fig. 1 and the horizontal position illustrated in Fig. 2 and depositing them in the same or a different intermediate position.

While one specific form of the invention has been illustrated in the accompanying drawings and described in this specification, it will be understood that this form of lifting apparatus does not by any means indicate the only form suitable for upending or otherwise positioning coils. For example it is contemplated that instead of a roller chain for the assembly 26 any other suitable form of flexible supporting medium or element may be employed if desired. The form illustrated herein is merely one which has been developed for commercial application of the invention. The invention, therefore, is not to be interpreted as being limited to the details described since these may be modified within the scope of the appended claims without departing from the spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a lifter mechanism adapted to operatively receive an article supported at one location on a supporting surface in one predetermined position of orientation and transport the article to another location and deposit the same on a supporting surface at said latter location in a different predetermined position of orientation, said lifter mechanism comprising in combination a lifter assembly proper, a traction hoist assembly, and an interconnecting, elongated, linear, flexible suspension member between the lifter assembly proper and the traction hoist assembly, said lifter assembly comprising a framework providing a fixed clamping jaw, a movable clamping jaw carried by said framework and movable toward and away from said fixed clamping jaw for article-clamping and article-releasing purposes respectively, a feed screw rotatably mounted on said framework and having a threaded connection with said movable clamping jaw, means including said threaded connection establishing a lost motion connection between said feed screw and said movable jaw whereby limited axial sliding movement of the movable jaw relative to the feed screw may take place independent of said threaded connection, a reversible motor mounted on said framework, a power train operatively connecting the motor and feed screw in driving relationship, said flexible member having one end thereof fixedly secured to said framework and having its other end secured to said movable jaw, the intermediate reach of the flexible member being normally slack, guide means for said intermediate reach of the flexible member whereby, upon application of upward lifting force to said intermediate reach at various points intermediate the ends of the flexible member, the latter will be drawn taut

Claim 1 continued -

and a degree of tensioning pull will be applied to said movable jaw tending to move the latter toward said fixed jaw, said traction hoist assembly including a traction drive wheel underlying said intermediate reach of the flexible member and over which the flexible member is adapted to pass in opposite directions respectively, and a reversible motor operatively connected to said traction drive wheel in driving relationship.

2. In a lifter mechanism adapted to operatively receive an article supported at one location on a supporting surface in one predetermined position of orientation and transport the article to another location and deposit the same on a supporting surface at said latter location in a different predetermined position of orientation, said lifter mechanism comprising in combination a lifter assembly proper, a traction hoist assembly, and an interconnecting flexible chain assembly between the lifter assembly proper and the traction hoist assembly, said lifter assembly comprising a framework providing a fixed clamping jaw, a movable clamping jaw carried by said framework and movable toward and away from said fixed clamping jaw for article-clamping and article-releasing purposes respectively, a feed screw rotatably mounted on said framework and having a threaded connection with said movable clamping jaw, means including said threaded connection establishing a lost motion connection between said feed screw and said movable jaw whereby limited axial sliding movement of the movable jaw relative to the feed screw may take place independent of said threaded connection, reversible motor mounted on said framework, a power train operatively connecting the motor and feed screw in driving relationship, said flexible chain assembly comprising a chain length having one end thereof fixedly secured to said framework adjacent one end thereof and having its other end secured to said movable jaw, the intermediate reach of said chain being normally slack and passing loosely around the other end of the framework and from thence passing in reentrant fashion toward said one end of the framework and loosely around said end, whereby, upon application of upward lifting force to said intermeidate reach at various points intermediate the fixedly secured end of the chain and said other end of the chain, the chain

Claim 2 continued -

will be drawn taut and a degree of tensioning pull will be applied to said movable jaw tending to move the latter toward said fixed jaw, said traction hoist including a traction drive sprocket underlying said intermediate reach of the chain and over which the chain is adapted to pass in opposite directions respectively, and a reversible motor operatively connected to said traction drive sprocket in driving relationship.

3. In a lifter mechanism adapted to operatively receive an article supported at one location on a supporting surface in one predetermined position of orientation and transport the article to another location and deposit the same on a supporting surface at said latter location in a different predetermined position of orientation, said lifter mechanism comprising in combination a lifter assembly proper, a traction hoist assembly, and an interconnecting flexible chain assembly between the lifter assembly proper and the traction hoist assembly, said lifter assembly comprising a framework providing a fixed clamping jaw, a movable clamping jaw carried by said framework and movable toward and away from said fixed clamping jaw for article-clamping and article-releasing purposes respectively, a feed screw rotatably mounted on said framework and having a threaded connection with said movable clamping jaw, the threads of said threaded connection loosely fitting each other and establishing a lost motion connection between said feed screw and said movable jaw whereby limited axial sliding motion of the movable jaw relative to the feed screw may take place independent of said threaded connection, a reversible motor mounted on said framework, a power train operatively connecting the motor and feed screw in driving relationship, said flexible chain assembly comprising a chain length having one end thereof fixedly secured to said framework and having its other end secured to said movable jaw, the intermediate reach of the chain being normally slack, guide means for said intermediate reach of the chain whereby, upon application of upward thrust to said intermediate reach at various points intermediate the ends of the chain, the latter will be drawn taut and a degree of tensioning pull will be applied to said movable jaw tending to move the latter toward said fixed jaw, said traction hoist assembly including a

Claim 3 continued -

traction drive sprocket underlying said intermediate reach of the chain and over which the chain is adapted to pass in opposite directions respectively, and a reversible motor operatively connected to said traction drive sprocket in driving relationship.

4. In a lifter mechanism adapted to operatively receive an article supported at one location on a supporting surface in one predetermined position of orientation and transport the article to another location and deposit the same on a supporting surface at said latter location in a different predetermined position of orientation, said lifter mechanism comprising in combination a lifter assembly proper, a traction hoist assembly, and an interconnecting flexible chain assembly between the lifter assembly proper and the traction hoist assembly, said lifter assembly comprising a framework providing a fixed clamping jaw, a movable clamping jaw carried by said framework and movable toward and away from said fixed clamping jaw for article-clamping and article-releasing purposes respectively, a feed screw rotatably mounted on said framework and having a threaded connection with said movable clamping jaw, the threads of said threaded connection loosely fitting each other and establishing a lost motion connection between the feed screw and movable jaw whereby limited axial sliding of the movable jaw relative to the feed screw may take place independent of said threaded connection, a reversible motor mounted on said framework, a power train operatively connecting the motor and feed screw in driving relationship, said flexible chain assembly comprising a chain length having one end thereof fixedly secured to said framework and having its other end secured to said movable jaw, the intermediate reach of the chain being normally slack, guide means for said intermediate reach of the chain whereby, upon application of upward thrust to said intermediate reach at various points intermediate the ends of the chain, the latter will be drawn taut and a degree of tensioning pull will be applied to said movable jaw tending to move the latter toward said fixed jaw, said traction

Claim 4 continued -

hoist assembly including a traction drive sprocket underlying said intermediate reach of the chain and over which the chain is adapted to pass in opposite directions respectively, and a reversible motor operatively connected to said traction drive sprocket in driving relationship.

5. In a lifter mechanism adapted to operatively receive an article supported at one location on a supporting surface in one predetermined position of orientation and transport the article to another location and deposit the same on a supporting surface at said latter location in a different predetermined position of orientation, said lifter mechanism comprising in combination a lifter assembly proper, a traction hoist assembly, and an interconnecting flexible chain assembly between the lifter assembly proper and the traction hoist assembly, said lifter assembly comprising a framework providing a fixed clamping jaw, a movable clamping jaw carried by said framework and movable toward and away from said fixed clamping jaw for article-clamping and article-releasing purposes respectively, a feed screw rotatably mounted on said framework and having a threaded connection with said movable clamping jaw, the threads of said connection loosely fitting each other and establishing a lost motion connection between the feed screw and movable jaw whereby limited axial sliding of the movable jaw relative to the feed screw may take place independent of said threaded connection, a reversible motor mounted on said framework, a power train operatively connecting the motor and feed screw in driving relationship, said flexible chain assembly comprising a chain length having one end thereof fixedly secured to said framework adjacent one end thereof and having its other end secured to said movable jaw, the intermediate reach of the chain being normally slack and passing loosely around the other end of the framework and from thence passing in reentrant fashion toward said one end of the framework and loosely around said end whereby, upon application of upward thrust to said intermediate reach at various points intermediate the fixedly secured end of the chain and said other end thereof, the chain will be drawn taut and a degree of

Claim 5 continued -

tensioning pull will be applied to said movable jaw tending to move the latter toward said fixed jaw, said traction hoist including a traction drive sprocket underlying said intermediate reach of the chain and over which the chain is adapted to pass in opposite directions respectively, and a reversible motor operatively connected to said traction drive sprocket in driving relationship.

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